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PARSONS ENGINEERING SCIENCE, INC.

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August 18, 1995

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Mr. Bruce Troutman
EG&G Rocky Flats, Inc.
Rocky Flats Environmental Technology Site
P.O. Box 464, Building 080
Golden, Colorado 80402-0464

Subject: MTS 343756 GG
OU4 Solar Ponds RFI/RI
SEP 207-C Hand Augering Alternatives Analysis

Dear Mr. Troutman:

Parsons ES has been asked to prepare a design for a coffer dam that could be used to had auger SEP 207-C if water remained in the Pond. An analysis of potential alternatives has been conducted. The attached report provides the alternatives analysis results. Parsons ES recommends that the livestock watering trough alternative be implemented because it is the easiest alternative to procure and fabricate in order to meet the schedule requirements, and is the most cost effective.

Please call me at 764-8811 or pager 687-2551 if you have any questions.

Sincerely,

Philip A. Nixon
Project Manager: Solar Pond IM/IRA

cc:

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ANALYSIS OF ALTERNATIVES FOR THE DEWATERING OF SEP 207-C

1.0 INTRODUCTION

The purpose of this report is to identify potential alternatives for dewatering SEP 207-C, and to perform an evaluation so that the most appropriate method is utilized. The alternatives which have been identified include:

1. Metal coffer dam,
2. Sand-filled tube, and
3. Caisson augering.

The alternatives will be evaluated with respect to the following criteria:

1. Effectiveness,
2. Implementability,
3. Cost, and
4. Safety.

The effectiveness criteria will address how well the alternative is expected to perform in a de-watering capacity. The implementability criteria will address whether the alternative can be procured and/or fabricated in an approximate 2 week period to meet the RMRS schedule. The cost of each alternative will be assessed. The final criteria will address safety concerns with respect to each alternative.

2.0 METAL COFFER DAM

This alternative would involve procuring a large metal livestock watering trough and cutting the bottom out. The trough would be pounded into the bottom of SEP 207-C (about 1/2 inch). The water within the trough would be pumped out/baled out leaving a dry area for the field team to work within.

2.1 Effectiveness

The trough walls would not leak as they are designed to hold water. However, it is expected that obtaining a seal between the pond bottom and the trench wall could be difficult. If the trough were not pounded into the pond bottom far enough, there could be leaks. If the trough were pounded into the pond bottom too far the integrity of the asphalt could be breached and provide a source of subsurface soil/ground water contamination. Design modification could be made to the trough to enhance the ability to obtain an effective seal. The bottom of the trough will be cut leaving a lip of approximately 2 feet. The bottom rim of the trough will be enhanced by the addition of a foam pad that will improve the flexibility of the seal. Two-inch diameter foam pipe insulation will be cut in half and mounted to the lower rim of the trough.

When the trough is installed, plastic roofing tar will be applied to the foamed rim and lip. This will enhance the seal of the trough to the pond bottom. Sand bags may be placed on the rim in the inside of the trough to stabilize the coffer dam with respect to wind. Plastic roofing tar will be applied to the edge of the trough's lip at the interface point to the pond bottom. Figure 1 provides a sketch of this design. Bentonite tar around the outer edge may be to prevent leaks if the trough is installed in standing water. The largest trough commercially available is 10 feet in diameter.

2.2 Implementability

It is estimated that a livestock trough could be procured within 5 days. The bottom would have to be cut out of the trough prior to utilization. This alternative has the advantage of being able to be re-used for all three holes. This alternative would also generate very little waste.

2.3 Cost

The cost of a trough is $300. It would cost approximately $100 to cut the bottom out of the trough. It is estimated that bentonite or roofing tar would also be needed. These materials will be at the job site anyway and are therefore not included in the cost estimate.

2.4 Safety

The modified livestock trough may have sharp edges that could cause cuts during transport between locations. The thin metal wall would not provide much rigidity if it were bumped during drilling activities. If someone backed into it inadvertently, they could fall into the pond. However, the sides of the livestock trough are approximately 2 1/2 feet.

3.0 SAND-FILLED TUBE

This alternative is based on an innovative technology that has been field demonstrated only. It uses proven oil field equipment to fill geosynthetic bags with a sand-water slurry. These bags can be designed in any shape. The proposed shape for SEP 207-C is an elliptical donut shape ring with the inner side of the bag constructed from a very low hydraulic conductivity material and very porous outer shell. Once filled, the inner hole side of the donut area would be pumped/bailed out. Due to the bag's construction, the inner liner would prevent pond water from reentering the evacuated hole and its flexible shape along with the physical weight would form a seal with the pond liner.

3.1 Effectiveness

Since the design of the sand bag donut is flexible, any size and shape can be configured to meet the needs of drilling for a work area. With the flexibility to use geosynthetic materials in the construction, a water tight inner side to the donut can be incorporated. Additionally, the

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Calculation Sheet

Rev	By	Date	Ck	Date	Title Livestock Watering Trough Option RFETS C-Pond FIGURE 1
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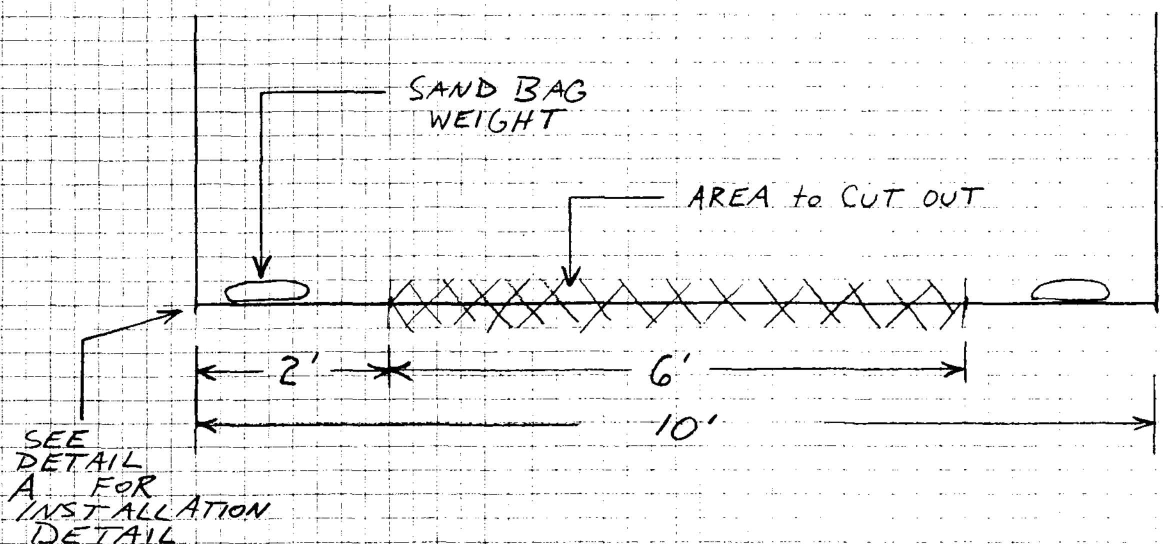
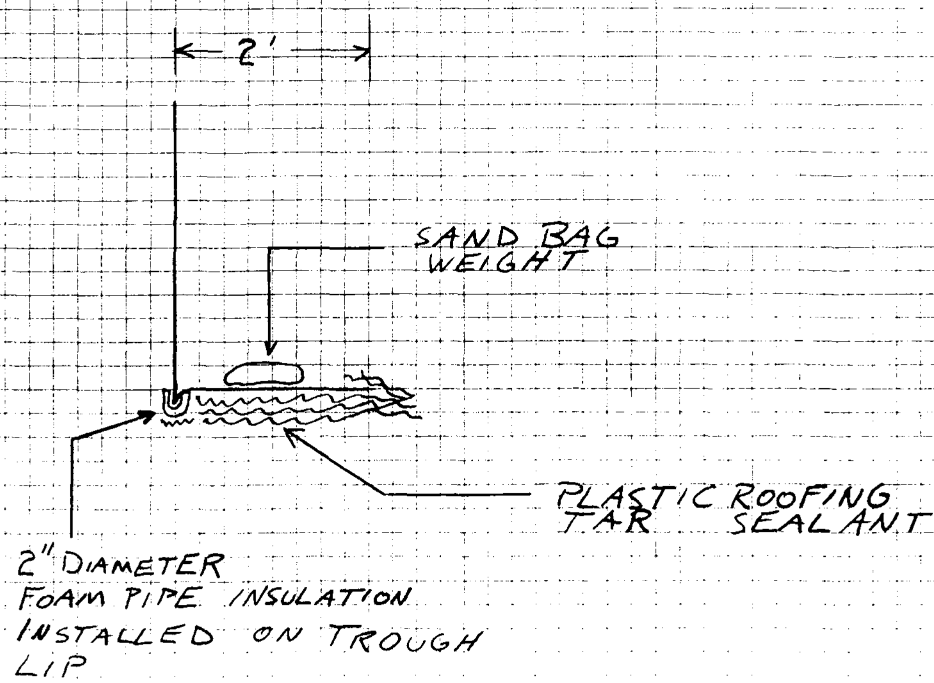


CROSS SECTIONAL DIAGRAM

DETAIL A - INSTALLATION DETAIL



sand bag donut can be positioned over the drill-site and quickly filled from the edge of the SEP with the minimal amount of personnel being in the SEP. Because the sand bag is flexible, it will conform to most irregularities along the bottom of the SEP. Obtaining a seal in areas where the top of the pond liner is fissured may be unlikely unless the liner is soft. To date, only small diameter size bags have been filled. Large diameter bags (12-16 inch diameter) may have to be tested prior to installation in the SEP. In a meeting with the vendor it was determined that testing would be required for tubes of 12-16 inches in diameter.

3.2 Implementability

Testing of a donut-like configuration would be required since this method has only been demonstrated in straight tubes. The availability of the mixing/application system is uncertain. It is estimated that the design and construction of the sand bag donuts can be fabricated within two weeks. With an unknown amount of water in the SEP, at the estimated start date, multiple bags will have to be constructed to match the potential needs. Matching the sand bag's diameter to the depth of the water will keep waste to a minimum. Additionally with a two week notice, the other equipment (the hydrofrac truck and fittings) necessary to fill the sand bags can be procured. There is a concern that the required testing may not be able to be completed in time to meet the project schedule.

3.3 Cost

The cost of fabrication is estimated to be $100/bag. Additional fittings and hoses associated with the equipment is estimated to be $300. The rental of the equipment for a half day is estimated to be $5000. A truck load of sand is estimated to be $100.

3.4 Safety

No sharp objects should be associated with the sand bags. But since the sand bag donut is a low object there is possibility that it may inadvertently tripped over during drilling or installation activities. Also the hoses that inject the sand-water mixtures into the bag are under pressure and need to be handled with added care to prevent injury to workers.

4.0 CAISSON AUGERING

This option provides for the positioning of a 12 inch-diameter steel caisson using a forklift. The attached drawing illustrates a tubular steel framed, plywood decked platform secured to the tines of a forklift. All personnel operations, including auguring, would be conducted on the platform. A caisson (to be used reused for each hole) would hang through a hole in the platform and be supported (prior to positioning for drilling) by a collar welded to the outside of the caisson. After the forklift positions the caisson over the prospective drilling locations the tines would be lowered so that the caisson just rests on the pond bottom. Additional lowering of the tines will exert downward force on the caisson via four springs thus achieving penetration of the asphalt by the sharpened lower edge of the caisson. Asphalt penetration will be limited by the tension applied to the springs and by a lip welded to the inside of the caisson. Following seating of the caisson a peristaltic or equivalent pump will be used to evacuate the caisson. Entry of water into to evacuated caisson will be prevented by the asphalt penetration and by the presence of a plastic sealant applied to the bottom of the inner-caisson lip. All drilling/auguring will be conducted through the caisson. Installation of bentonite pellets in the auger hole followed by application of asphalt sealant and tamping will precede removal of the caisson. Figure 2 provides a sketch of this design.

4.1 Effectiveness

Caisson sealing constitutes the greatest unknown for this proposed technique. Penetration force could be enhanced by increasing spring tension or by installing semi-rigid connecting links (eg., a short length of chain) between the platform and the caisson. In this mode downward force is limited only by the hydraulic power of the forklift. Hammering of the caisson could also be used if necessary. The plastic sealant provides additional water-tightness. A plastic/asphalt roof cement designed to be applied in wet environments is commercially available and recommended for this application. Water volume to be removed from the caisson is only about 12 gallons.

Assuming that a good seal can be obtained, the only other issue relevant to the effectiveness of this method is the drilling of the asphalt and subsequent auguring. It is recommended that a core bit capable of cutting asphalt and equipped with a pilot bit be used. An impact-type device (eg. a jack hammer) is not recommended due to the possibility of cracking the asphalt and destroying the caisson seal. If a core bit is used a pilot bit will be required because of the tendency of the bit to "skate", especially when fixed to the end of an extension as would be required in this case. There is uncertainty with respect to the effectiveness of penetrating the asphalt liner from within the small pipe.

4.2 Implementability

Obtaining the necessary materials (eg., tubular steel, 12 inch diameter pipe, springs etc.) represents no difficulty. Construction of the platform and caisson should be no problem for an ordinary welding shop. Grinding the leading edge of the caisson could be done by hand but lathe turning is recommended to achieve an even edge. The latter would require a shop with a large-capacity lathe.

Estimated time for procurement and construction is about one week under ideal conditions (especially availability of welding and machining capabilities). This also ready access to and availability of a fork lift.

Availability of suitable asphalt coring equipment and the necessary power source is unknown.

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Calculation Sheet

Rev	By	Date	Ck	Date
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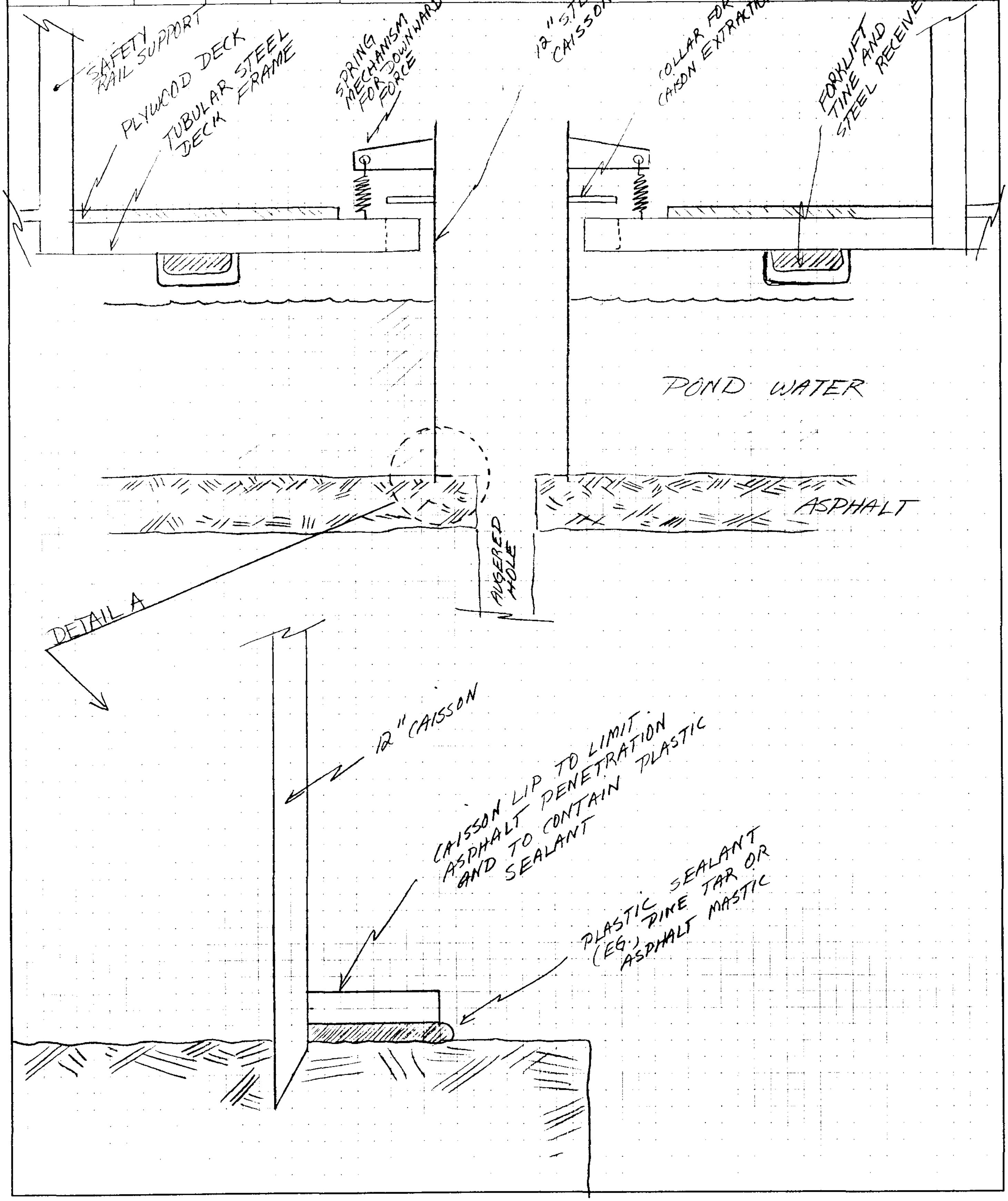
Title Caisson Augering Option RFETS – C POND

FIGURE 2

Author Schmiermund Sheet 1 Of 1



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4.3 **Cost** (assuming private sector costs)

Total material costs are estimated to be approximately $500.

Total labor/fabrication costs estimated approximately $1,000.

4.4 Safety

The primary safety issue here is contact with the pond water. All personnel operations would take place on the deck above the water. The deck would be outfitted with railings secured to the frame of the platform and the risk of falling into the pond is considered negligible. No direct contact with pond water is anticipated during installation of the caisson, pumping or drilling.

5.0 CONCLUSION AND RECOMMENDATION

Based on the above analysis of alternatives, Parsons Engineering Science recommends that the metal coffer dam be implemented for the OU4 hand augering in SEP 207-C. This recommendation is based on information provided in Table 5.1. The sand-filled tube alternative was not selected because the technology is still developmental and would require testing for tubes at 12-16 inch diameter, as well as circular type connected tubes. The caisson augering alternative was not selected due primarily to the fact that it was not certain that the liner could be penetrated successfully from within the small pipe. In addition the fabrication and installation of the work platform on to the fork lift vehicle may not be able to be accomplished within the project schedule requirements. The metal coffer dam was selected because it is the easiest alternative to procure and implement, and is the most cost effective. Parsons ES will focus the design effort to maximize the effectiveness and safety of this recommended alternative.

Table 5.1
Alternative Summary Table

Alternative	Effectiveness	Implementability	Cost	Safety
Metal Coffer Dam	medium	high	low	medium
Sand-filled Tube	medium	uncertain	high	high
Caisson Augering	high	medium	medium	medium

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